SIGNIFICANT FIGURES
ASSIGNMENT

(33)

(a) $\dfrac{2.526}{3.1} + \dfrac{0.470}{0.623} + \dfrac{80.705}{0.4326}$

$= 0.81(5) + 0.754(4) + 186.5(6) \implies$

$$\begin{array}{r} 0.81(5) \\ + \ 0.754(4) \\ + \ 186.5(6) \\ \hline 188.1|294 \end{array}$$

$188.1 \impliedby$

(b) $\dfrac{6.404 \times 2.91}{18.7 - 17.1} = \dfrac{6.404 \times 2.91}{1.6} = 12$

$$\begin{array}{r} 18.7 \\ - \ 17.1 \\ \hline 1.6 \end{array}$$

(c) $6.071 \times 10^{-5} - 8.2 \times 10^{-6} - 0.521 \times 10^{-4}$

8.2×10^{-6}: $\div 10^1$ ↓ $\times 10^1$ ↓ → 0.82×10^{-5}

0.521×10^{-4}: $\times 10^1$ ↓ $\div 10^1$ ↓ → 5.21×10^{-5}

$\therefore$
$$\begin{array}{r} 6.071 \times 10^{-5} \\ - \ 0.82 \ \times 10^{-5} \\ \hline 5.25|1 \times 10^{-5} \\ - \ 5.21 \ \times 10^{-5} \\ \hline 0.04|1 \times 10^{-5} \end{array}$$

$\implies 0.04 \times 10^{-5} \implies 4 \times 10^{-7}$

(d) $(3.8 \times 10^{-12} + 4.0 \times 10^{-13}) / (4 \times 10^{12} + 6.3 \times 10^{13})$

4.0×10^{-13}: $\div 10^1$ ↓ $\times 10^1$ ↓ → 0.40×10^{-12}

6.3×10^{13}: $\times 10^1$ ↓ $\div 10^1$ ↓ → 63×10^{12}

(d) continued:

$$3.8 \times 10^{-12}$$
$$+\ 0.40 \times 10^{-12}$$
$$4.20 \times 10^{-12}$$
$$\Rightarrow 4.2 \times 10^{-12}$$

$$4 \times 10^{12}$$
$$+\ 63 \times 10^{12}$$
$$67 \times 10^{12}$$

$$\therefore \quad \frac{4.2 \times 10^{-12}}{67 \times 10^{12}} = 6.3 \times 10^{-26}$$

(e)
$$9.5$$
$$+\ 4.1$$
$$+\ 2.8$$
$$+\ 3.175$$
$$19.575 \Rightarrow 19.5(75)$$

average:

$$\therefore \frac{19.5(75)}{4} = 4.9$$

the number of decimal places in an average value must be the same as that for the measurement with the smallest number of decimal places

(f) $\dfrac{(8.925 - 8.905)}{8.925} \times 100\%$

$$8.925$$
$$-\ 8.905$$
$$0.020$$

$$\therefore \ \frac{0.020}{8.925} \times 100\% = \begin{array}{c} 0.22\% \\ (\% \ error) \end{array}$$

(34)

(a) $6.022 \times 10^{23} \times 1.05 \times 10^{2} = 6.32 \times 10^{25}$

(b) $\dfrac{6.6262 \times 10^{-34} \times 2.998 \times 10^{8}}{2.54 \times 10^{-9}} = 7.82 \times 10^{-17}$

(c) $1.285 \times 10^{-2} + 1.24 \times 10^{-3} + 1.879 \times 10^{-1}$

$\downarrow \div 10^1 \quad | \times 10^1 \qquad | \times 10^1 \quad | \div 10^1$

$0.124 \times 10^{-2} \qquad 18.79 \times 10^{-2}$

$\therefore \quad 1.28|5 \quad \times 10^{-2}$

$+ \quad 0.12|4 \quad \times 10^{-2}$

$+ \quad 18.79 \quad | \quad \times 10^{-2}$

$\overline{20.19|9 \quad \times 10^{-2}} \quad \Rightarrow \quad 20.20 \times 10^{-2}$

$\Rightarrow \quad 2.020 \times 10^{-1}$

(d) $1.285 \times 10^{-2} - 1.24 \times 10^{-3}$

$\downarrow \div 10^1 \quad | \times 10^1$

0.124×10^{-2}

$\therefore \quad 1.285 \times 10^{-2}$

$- \quad 0.124 \times 10^{-2}$

$\overline{1.161 \times 10^{-2}} \quad \Rightarrow \quad 1.161 \times 10^{-2}$

(e) $\dfrac{(1.00866 - 1.00728)}{6.02205 \times 10^{23}}$

$\begin{array}{r} 1.00866 \\ - 1.00728 \\ \hline 0.00138 \end{array} \qquad \therefore \quad \dfrac{0.00138}{6.02205 \times 10^{23}} = 2.29 \times 10^{-27}$

(f) $\dfrac{9.875 \times 10^2 - 9.795 \times 10^2}{9.875 \times 10^2} \times 100\%$

$\begin{array}{r} 9.875 \times 10^2 \\ - 9.795 \times 10^2 \\ \hline 0.080 \times 10^2 \end{array} \qquad \therefore \quad \dfrac{0.080 \times 10^2}{9.875 \times 10^2} \times 100\% = 0.81\%$

(9)
$$\frac{\left(9.42 \times 10^2 + 8.234 \times 10^2 + 1.625 \times 10^3\right)}{3}$$

$$1.625 \times 10^3$$

$\downarrow \times 10^1$ $\downarrow \div 10^1$

$$16.25 \times 10^2$$

$\therefore$
$$9.42 \times 10^2$$
$$+ \; 8.234 \times 10^2$$
$$+ \; 16.25 \times 10^2$$
$$\overline{33.904 \times 10^2} \Rightarrow 33.90(4) \times 10^2$$

$\therefore$ average $= \dfrac{33.90(4) \times 10^2}{3}$

$\qquad\qquad = 11.30 \times 10^2$

$\qquad\qquad = 1.130 \times 10^3$